State of Utah

JON M. HUNTSMAN, JR.
Governor

GARY R. HERBERT
Lieutenant Governor

DEPARTMENT OF TRANSPORTATION

JOHN R. NJORD, P.E.
Executive Director

CARLOS M. BRACERAS, P.E.
Deputy Director

July 7, 2006

TO ALL BIDDERS CONCERNED:

SUBJECT:
STP-HPP-LC35(123)
Parley's I-215 Crossing and Trail Extension
Addendum Number: 1

To Whom It May Concern:

We are submitting the following changes to the subject project.

1. The "Notice to Contractors" has been revised. The Contract Completion Date is: June 22, 2007.

2. Special Provision 00555M Section 1.12 Contract Time has been revised. The Contract Completion Date is June 22, 2007. See the attached revised Special Provision Section 00555M.

3. The Geotechnical Report by Earth Tec dated January 11, 2005 is available. See the attached Parley's Trail Geo Tech Report, Legend, Test Hole Logs, Test Pit Logs and figures.

Please consider these revisions before submitting your bid.

***** DUE TO THE SIZE ONLY THE COVER LETTER WILL BE FAXED. *****

*** ADDENDUM IS AVAILABLE AND MAY BE DOWNLOADED FROM THE UDOT WEBSITE AT
http://www.udot.utah.gov/index.php?m=c&tid=317

RECEIPT OF THIS ADDENDUM MUST BE ACKNOWLEDGED WHEN YOU SUBMIT YOUR BID.
YOUR BID WILL BE DECLARED NON-RESPONSE IF YOU DO NOT ACKNOWLEDGE THIS ADDENDUM.

Sincerely,

UDOT Project Manager

Sincerely,

Pete Negus
Pete Negus
Deputy Construction Engineer

Attach: Special Provision 00555M
Parley's Trail Geotech Report

Region One Headquarters, 166 West Southwell Street, Ogden, Utah 84404
telephone 801-620-1600 • facsimile 801-620-1665 • www.udot.utah.gov

NOTICE TO CONTRACTORS

Sealed proposals will be received by the Utah Department of Transportation UDOT/DPS Building (4th Floor), 4501 South 2700 West, Salt Lake City, Utah. 84114-8220, until 2 o'clock p.m. Tuesday, July 18, 2006, and at that time the download process of bids from the USERTrust Vault to UDOT will begin, with the public opening of bids scheduled at 2:30 for Construct pedestrian bridge and trail of PARLEY'S I-215 CROSSING AND TRAIL EXTENSION in SALT LAKE County, the same being identified as Federal Aid Project No: STP-HPP-LC35(123).

Federal Regulations:
In conformity with the Federal-Aid Highway Act of 1968, the U.S. Department of Labor has certified the minimum wage rates to be paid on this contract. These rates are made a part of the contract documents. This Department has been advised by the Wage and Hour Division, U.S. Department of Labor, that contractors engaged in highway construction work are required to meet the provisions of the Fair Labor Standards Act of 1938, (52 Stat. 1060). This contract is subject to all appropriate Federal Laws, including Title VI of the Civil Rights Act of 1964.

Project Location: 0.46 Miles of Route: 0215 from R.P. to R.P.

The principal items of work are as follows (for all items of work see attachment):
- Modular Block Wall (R-465E)(Est. Lump Qty: 7471 sq ft)
- Structural Steel(Est. Lump Qty: 79490 lb)
- Modular Block Wall (R-465D)(Est. Lump Qty: 5264 sq ft)

The project is to be completed: June 22, 2007.

Other Requirements:
All project bidding information, including Specifications and Plans, can be viewed, downloaded, and printed from UDOT's Project Development Construction Bid Opening Information website, http://www.udot.utah.gov/index.php/m=c/tid=319. To bid on UDOT projects, bidders must use UDOT's Electronic Bid System (EBS). The EBS software and EBS training schedules are also available on this website.

Project information can also be reviewed at the main office in Salt Lake City, its Region offices, and its District offices in Price, Richfield, and Cedar City.

Project Plans cannot be downloaded or printed from the website unless your company is registered with UDOT. Go to UDOT's website to register. Unregistered companies may obtain a **CD**, that contains the Specifications and Plans, from the main office, 4501 South 2700 West, Salt Lake City, (801) 965-4346, for a fee of $20.00, plus tax and mail charge, if applicable, none of which will be refunded.

Prequalification of bidders is required. Prior to submitting a bid, the bidder must have on file with the Utah Department of Transportation a completed and approved contractor's application for prequalification. Department processing time is 10 working days from receipt of properly executed documentation.

As required, a contractor's license must be obtained from the Utah Department of Commerce.

Each bidder must submit an electronic bid bond from an approved surety company using UDOT's Electronic Bid System (EBS); or in lieu thereof, cash, certified check, or cashier's check for not less than 5% of the total amount of the bid, made payable to the Utah Department of Transportation, showing evidence of good faith and a guarantee that if awarded the contract, the bidder will execute the contract and furnish the contract bonds as required.

The right to reject any or all bids is reserved.

If you need an accommodation under the Americans with Disabilities Act, contact the Construction Division at (801) 965-4346. Please allow three working days.

Additional information may be secured at the office of the Utah Department of Transportation, (801) 965-4346.

Dated this 24th day of June, 2006.

UTAH DEPARTMENT OF TRANSPORTATION
John R. Njord, Director

Revised Date:

July 7, 2006

SPECIAL PROVISION
STP-HPP-LC35(123)
SECTION 00555M

PROSECUTION AND PROGRESS

Delete Article 1.6, paragraph A and replace with the following:

A. Develop a baseline construction schedule using Primavera 5.0 (or the current version) or Primavera Contractor. Accurately reflect in the schedule the proposed approach to accomplish the work outlined in the Contract documents conforming to all requirements of this article.

Add the following to PART 1, GENERAL

1.9 LIMITATION OF OPERATIONS

D. Keep all lanes and shoulders of Interstate 215 open at their full width except as noted below:

1) For a maximum of 50 working days, closure of the right travel lane and shoulder on Foothill Drive Southbound to I-215 Southbound will be allowed through the work zone, except as follows:
   No lane closures or active work allowed on shoulder during PM peak times 4:00 PM to 7:00 PM Monday through Friday. Active work is defined as any equipment vehicles accessing onto live travel lane or encroachment onto live travel lane. Shoulder closure should not encroach to the travel lane and must comply with standard clear zone requirements. Slow equipment vehicle(s) accessing live traffic lanes should be escorted by authorized vehicle. No equipment storage on shoulder within the clear zone.

2) No lane closures or work impacting live traffic lanes on I-215 mainline Monday through Friday during AM peak hours 6:30 AM to 9:00 AM and PM peak hours 4:00 PM to 7:00 PM.

3) One full Closure of I-215 will be allowed to set the pre-fabricated bridge into place. This closure is allowed on a non-holiday weekend on Sunday night between 10:00 PM to Monday at 5:00 AM or Saturday night at 10:00 PM to Sunday 6:00 AM. Coordinate with UDOT Region Traffic Engineer to determine which night is best regarding traffic volume demand and special events. See the MOT plan sheets for detour route required.

4) Holidays and Special Events: No work allowed on holidays including holiday weekends. No work allowed on I-215 or Southbound Foothill Ramp during special events. Coordinate with UDOT Region Traffic Engineer concerning special event schedules.

5) Maintain minimum of two portable VMS signs during construction.

E.

1) For the Bonneville Shoreline Trail maintain at least a 6 foot wide stabilized pathway for trail users during the project. Provide temporary fencing around the work zone to provide a safe pathway. Provide any necessary traffic control on the trail for pedestrians and bicyclists. See the MOT plan sheets.

F.

1) The contractor may access the Parley's Nature Park from the gate near Tanner Park. No work on weekends or holidays will be allowed in the Parley's Nature Park. Store equipment and materials only in the designated Staging Area of the Nature Park. See the MOT Plan Sheet MT-2. Use temporary construction fencing to separate park users from the work activities and storage areas. Use water truck for dust control when hauling materials and equipment in and out of the Nature Park and dust control for work in the park. Minimize tracking out of the park. All rutting and damage caused by the contractor to the Nature park roadways and trail ways shall be repaired back to their original condition before final acceptance and payment will be made.

2) Parley's Nature Park is an off leash dog area with heavy pedestrian use. Minimize impacts to park users. Use caution and be courteous to park users and their pets. Keep existing roads and trails in the Nature Park open during construction, except for short periods of time as required for pedestrian safety. Use flaggers, pedestrian traffic control, signing, and fencing as necessary to keep park users and their pets safe.

3) The contractor will not be permitted to waste excavation materials on the fill slope below the trail. See Drawing Sheet TS-4, Typical Section No. 9.

The Engineer has the right to stop work and assess daily liquidated damage charges (as referenced below) for each day of non-compliance with any of the items outlined above in Sections 1.9 D, E, and F.

Failure to meet the above requirements in Sections 1.9 D, E, and F will result in a contract price adjustment as outlined in Specification 01554 Traffic Control Section 1.10.

G. **Limit field operations to a maximum of 90 Working Days.** Field operations are defined as activities when the Engineer must be on the project site to inspect, monitor, document or verify any operations performed by the contractor. The contractor may break the working days into two terms. Provide two weeks notice to the Engineer before starting and stopping Working Day terms.

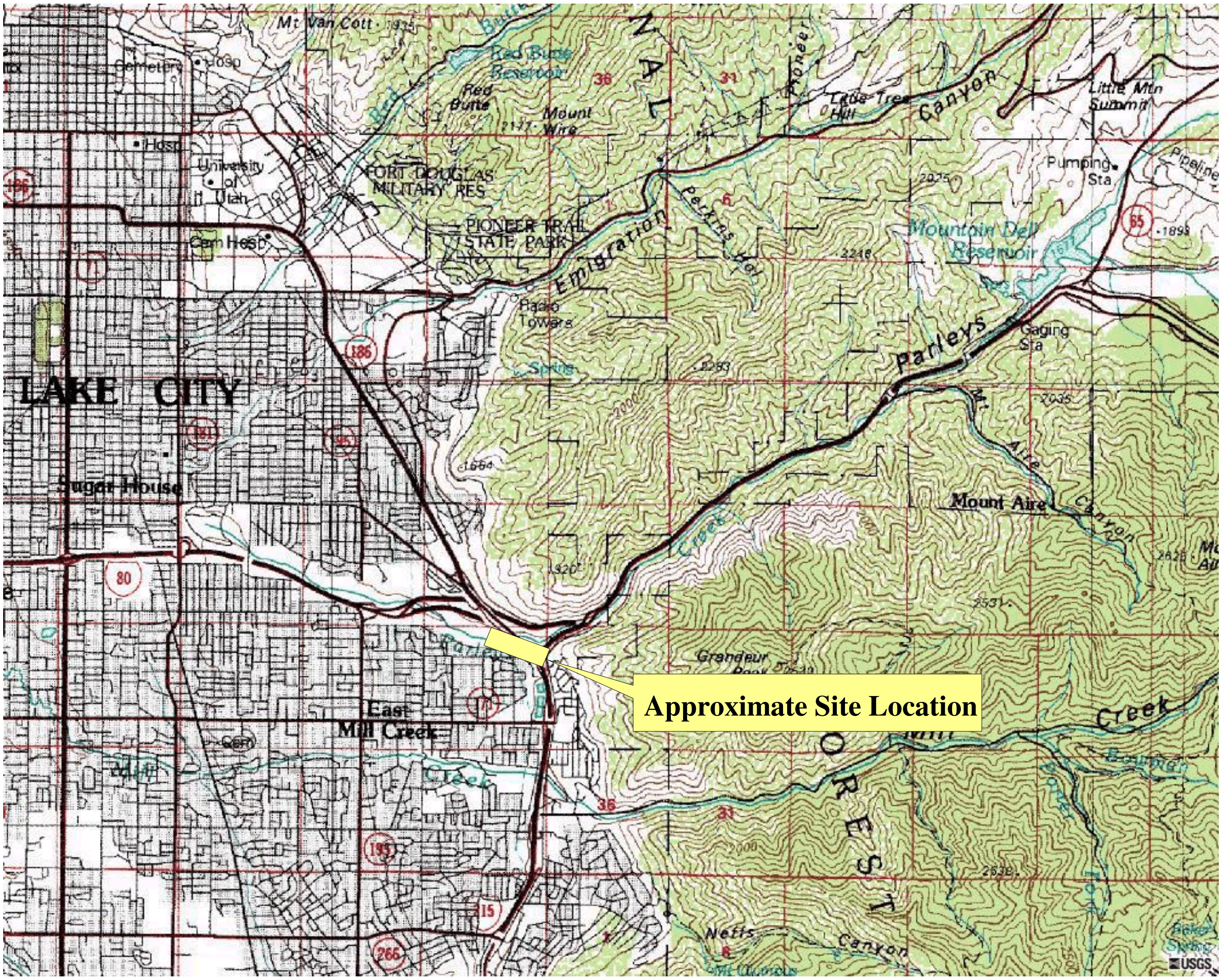
The contractor will be charged Liquidated Damages of $2170 per day for Working Days used in excess of 90 days (See Standard Specification Section 00555 Section 1.14).

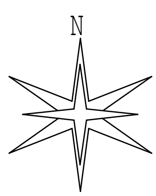
1.12 CONTRACT TIME

G. **Contract Completion Date: June 22, 2007**.

VICINITY MAP

PARLEY'S CREEK TRAIL & PEDESTRIAN BRIDGE OVER I-215



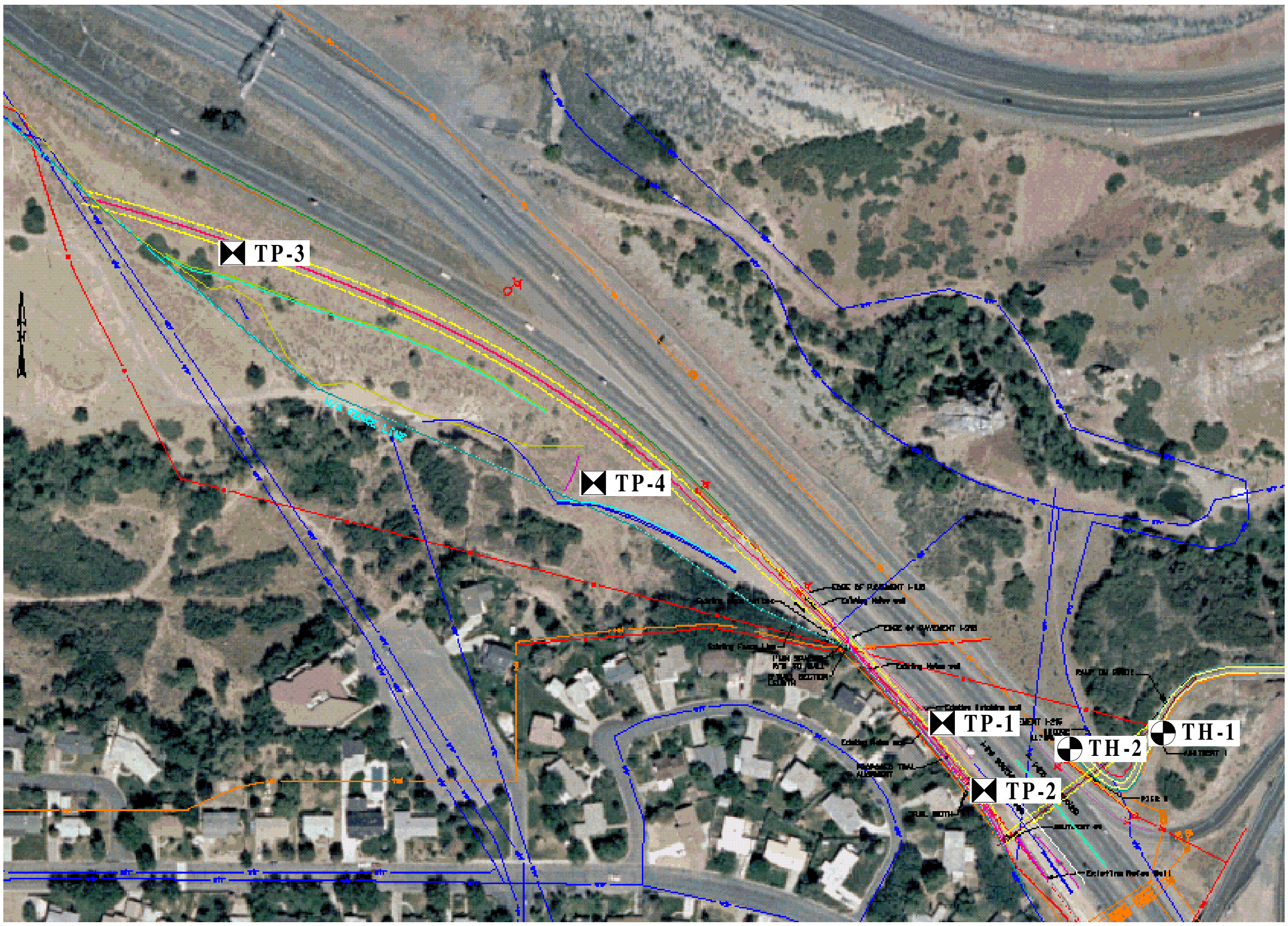


PROJECT NO.: 052224

FIGURE NO.: 1

LOCATION OF TEST HOLES & TEST PITS

PARLEY'S CREEK TRAIL & PEDESTRIAN BRIDGE OVER I-215



Approximate Test Hole Location

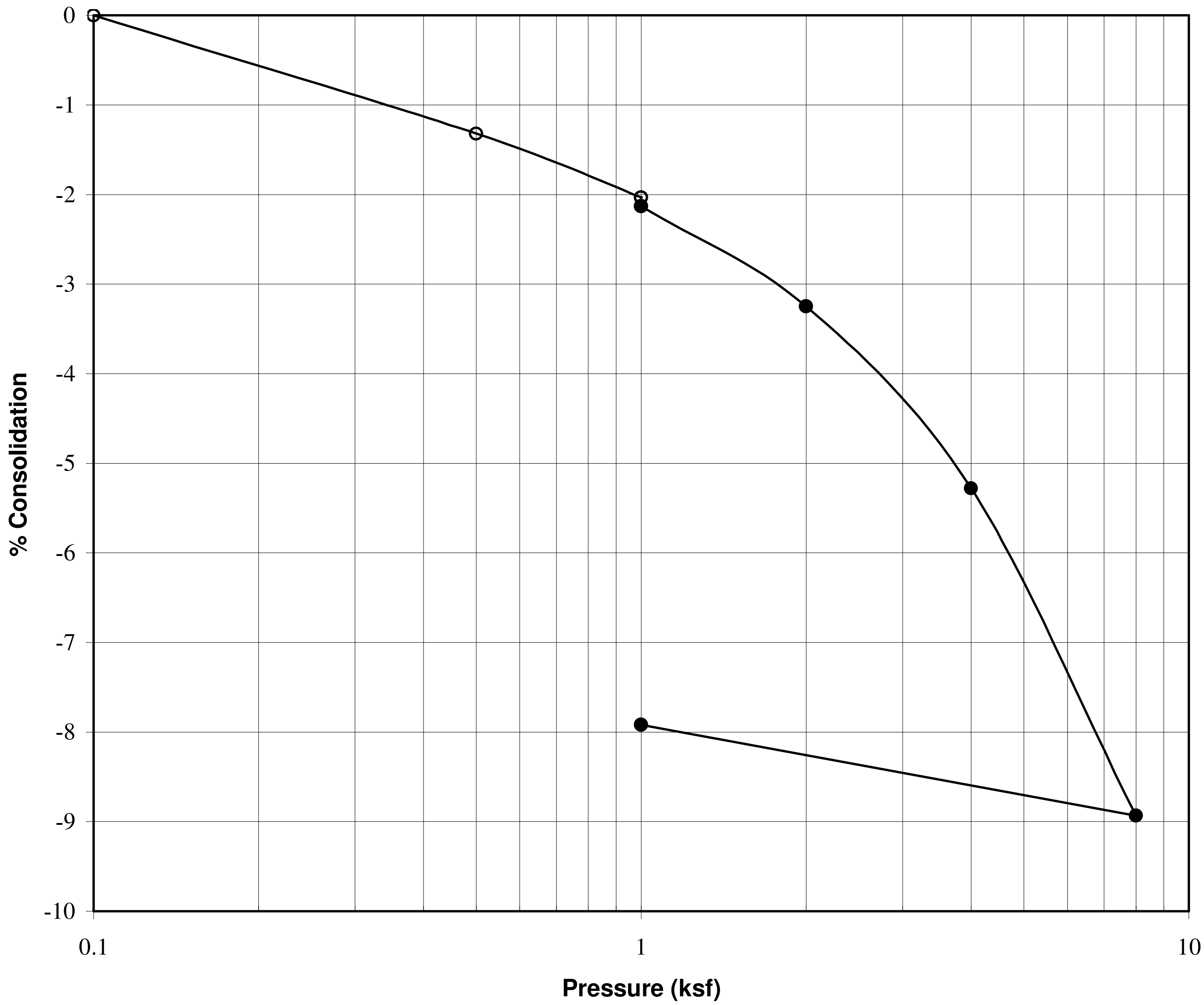
Approximate Test Pit Location

N

Not to Scale

PROJECT NO.: 052224	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 2

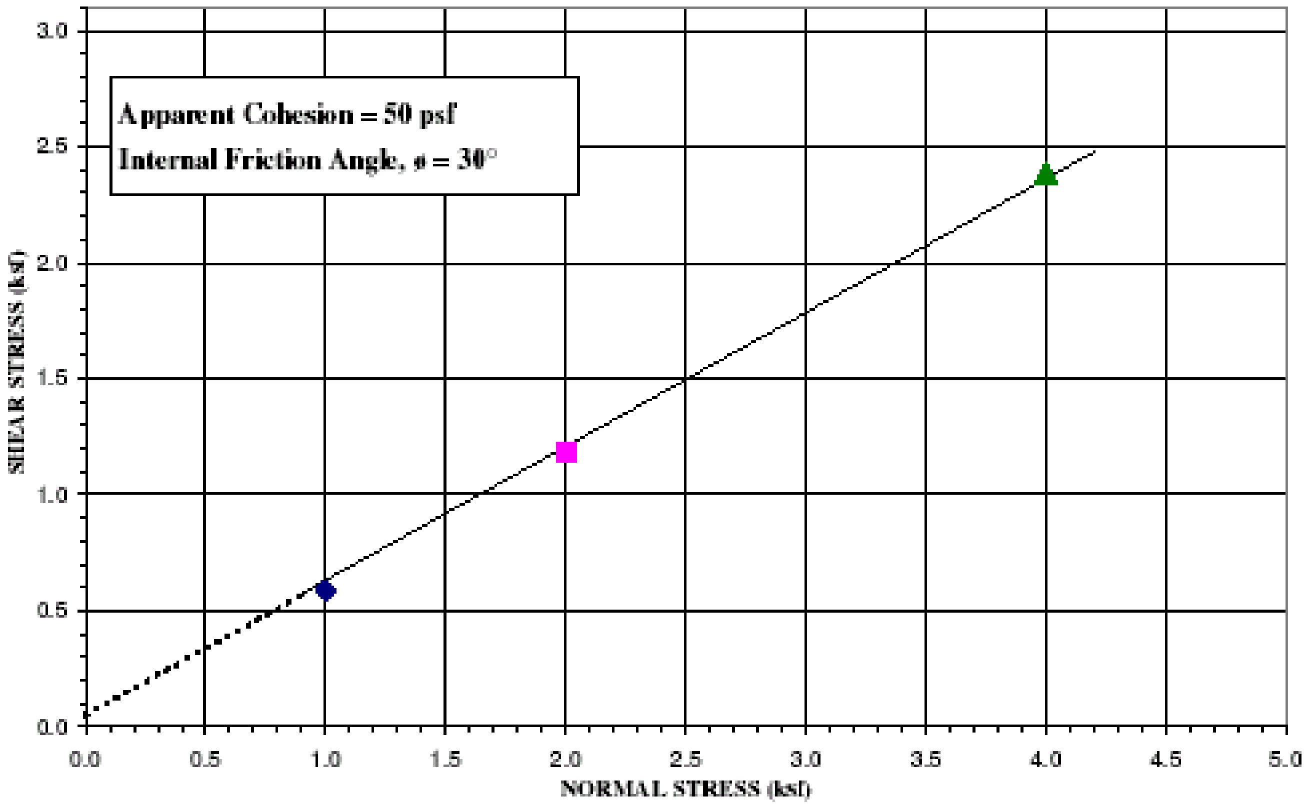
CONSOLIDATION - SWELL TEST

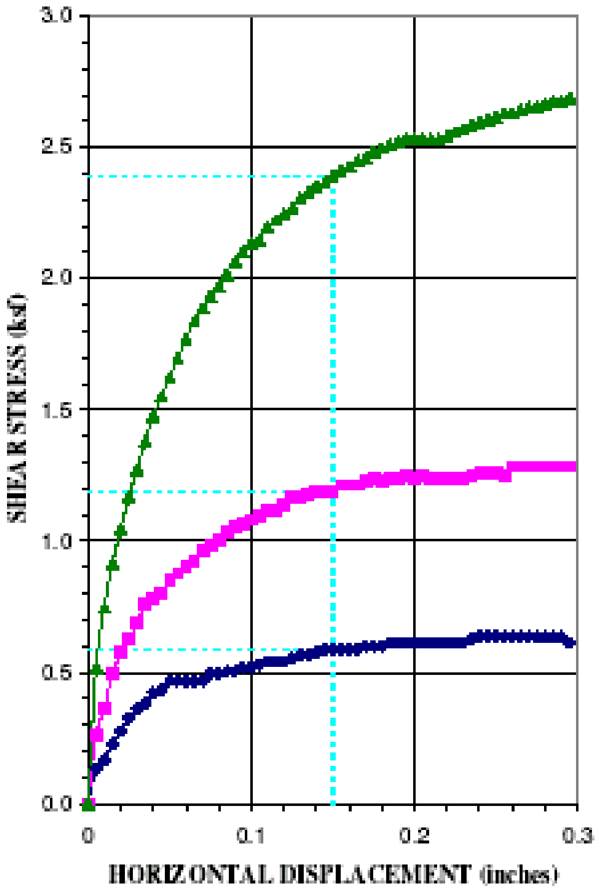


Project:	Parley's Trail & Pedestrian Bridge over I-215
Location:	TP-2
Sample Depth:	8
Description:	Block
Soil Type:	Sandy SILTY CLAY (CL-ML)
Dry Density, pcf:	89
Natural Moisture, %:	24
Liquid Limit:	26
Plasticity Index:	5
Water Added at:	1 ksf
Percent Collapse:	0.1

PROJECT NO.: 052224	Earthtec Testing and Engineering, P.C.	**FIGURE NO.:** 10

DIRECT SHEAR TEST





Source: TP-2	Depth: 4 feet
Type of Test:	Consolidated Drained/Saturated

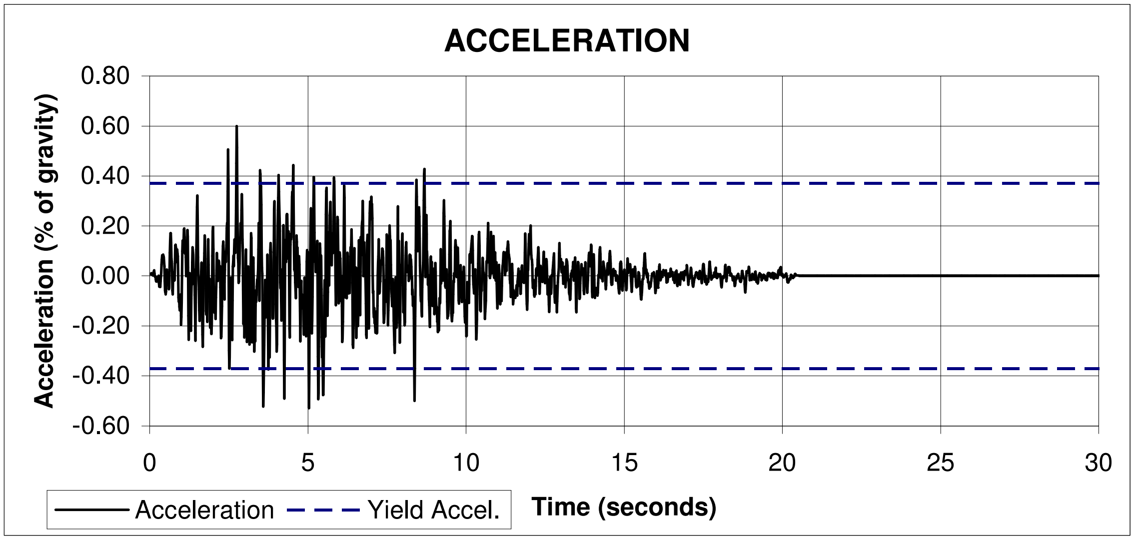
Test No. (Symbol)	1 (◆)	2 (■)	3 (▲)
Sample Type	Block Sample		
Initial Height, in.	1	1	1
Diameter, in.	2.4	2.4	2.4
Dry Density Before, pcf	84.4	105.2	105.3
Dry Density After, pcf	85.0	107.6	107.2
Moisture % Before	17.2	17.2	17.2
Moisture % After	30.1	26.6	21.4
Consolidation Load, kg	0.7	1.4	2.9
Normal Load, ksf	1.00	2.00	4.00
Shear Stress, ksf	0.59	1.19	2.39
Strain Rate	0.0042 in/min		

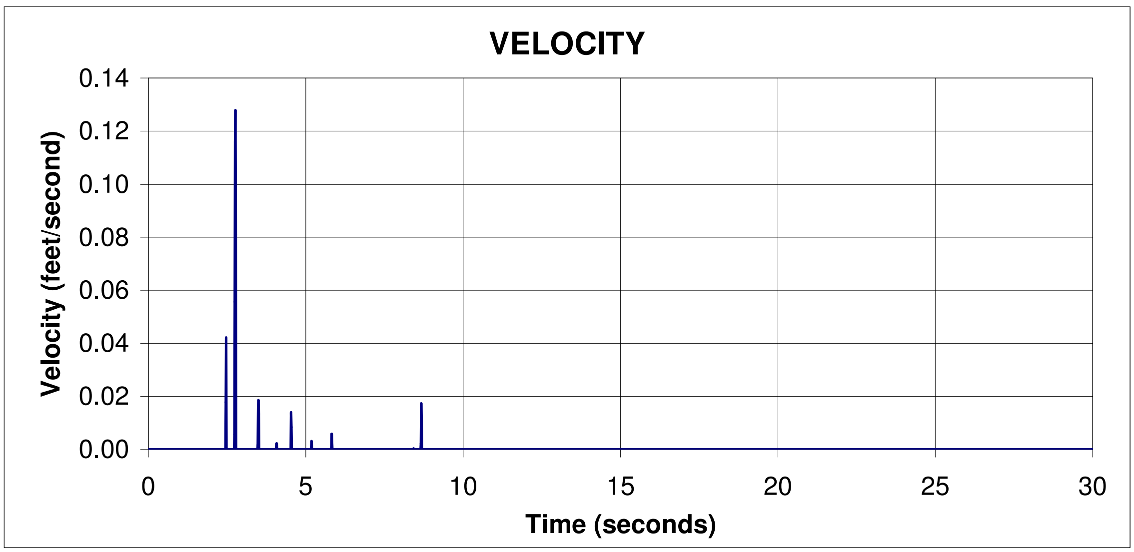
Sample Properties	
Cohesion, psf	50
Friction Angle, ϕ	30
Liquid Limit, %	25
Plasticity Index, %	6
Percent Gravel	---
Percent Sand	---
Percent Passing No. 200 sieve	---
Classification	Sandy SILTY CLAY (CL-ML)

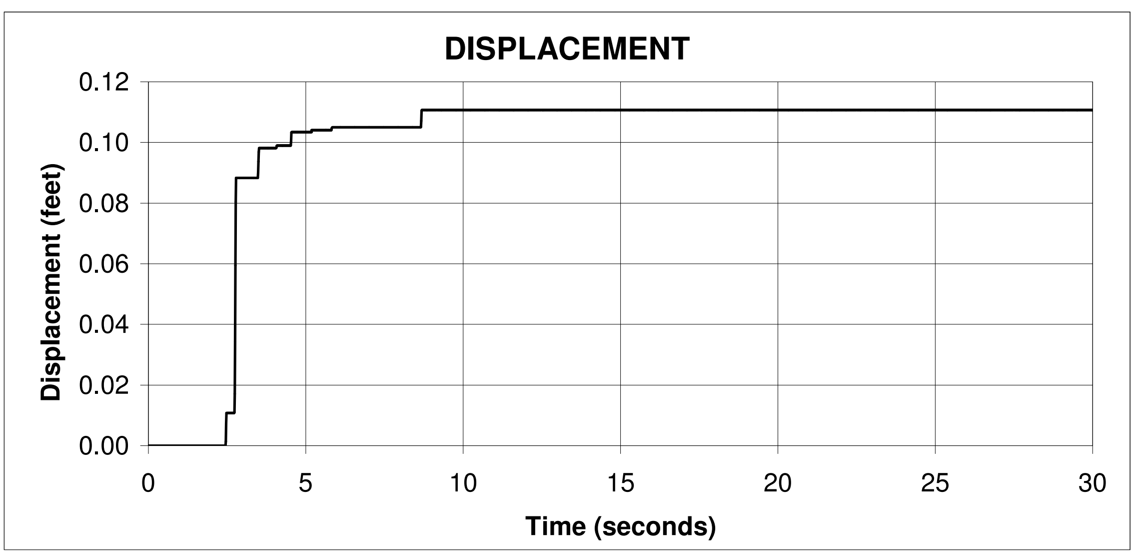
PROJECT: Parley's Trail & Pedestrian Bridge over I-215

PROJECT NO.: 052224 | Earthtec Testing and Engineering, P.C. | FIGURE NO.: 11

NEWMARK DISPLACEMENT METHOD - ANALYSIS RESULTS







PROJECT NO.: 052224	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 16

Earthtec Testing & Engineering, P.C.

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GEOTECHNICAL STUDY
PARLEY'S CREEK TRAIL
& PEDESTRIAN BRIDGE OVER I-215
SALT LAKE CITY, UTAH

Prepared By:

Earthtec
Testing and Engineering, P.C.

133 North 1330 West
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(801) 225-5711

Job No. 052224

Prepared for:

H.W. Lochner
Attn: Todd Perkins, P.E.
310 East 4500 South, Suite 600
Murray, UT 84107

January 11, 2005

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FIGURES

TABLES

1.0 INTRODUCTION

This report presents the results of a geotechnical study for the proposed Parley's Creek Trail and associated pedestrian bridge over I-215 near the mouth of Parley's Canyon in Salt Lake City, Utah. The general location of the site is shown on Figure 1, *Vicinity Map*, at the end of this report.

The purposes of this study were to 1) evaluate the subsurface soil conditions, 2) assess the engineering characteristics of the subsurface soils, and 3) provide geotechnical recommendations for the design and construction of the trail, bridge foundations and associated earthwork and pavement design. The scope of work completed for this study included field reconnaissance, subsurface exploration and soil sampling, laboratory soil testing, engineering analysis, and the preparation of this report.

2.0 SUMMARY

The following is a brief summary of our findings and conclusions:

1. Four test pits were excavated to depths of approximately 10 to 17 feet below existing grade along the proposed trail, with one of the test pits near the proposed west abutment of the bridge. Two test holes were drilled to depths of about 21½ to 41½ feet below existing grade near the east abutment and bent locations. The subsurface soils at the exploration points varied, depending on location, from Silty to Clayey SAND (SM to SC) soils, to Sandy SILTY CLAY (CL-ML), to Clayey or Poorly Graded GRAVEL with silt and sand (GC or GP-GM) soils. Up to 6 inches of topsoil was encountered in three of the four test pits. Groundwater was not encountered in the explorations.

2. Based on our conversations with the structural engineer, we understand that conventional strip/spread footing foundations will be utilized for supporting the proposed bridge structure. Based on the results of our field exploration and laboratory testing, our analysis indicates that shallow foundations may be used provided our geotechnical recommendations presented in Section 9.0 are followed.

These findings and conclusions should not be relied upon without reading and consulting this report for a more detailed description of the geotechnical evaluation and recommendations contained herein.

3.0 PROPOSED CONSTRUCTION

We understand that the project as planned will consist of constructing approximately 1500 feet of pedestrian/bike trail and a pedestrian bridge over I-215. The trail, which will be paved with asphalt and concrete (in some areas), will be constructed along the west/southwest side of I-215, through relatively steep terrain that will require cut/fill slopes and retaining walls. Segmented block walls are currently planned as retaining wall elements, with maximum wall heights up to about 14 feet. The existing retaining wall will be removed and replaced with a new segmented block wall as part of the trail construction.

The proposed bridge will be located just south of where I-215 traverses Parley's Creek. Three support locations are proposed, with the east abutment just north of the existing bike path, a bent location planned between the existing bike path and northbound I-215, and the west abutment near existing sound walls and existing slopes. The structural engineer (Michael Baker Inc.) for this project has indicated that spread footing foundations are planned for the new bridge, and footing sizes will be approximately 10 feet by 15½ feet at the abutments, 16 feet by 22 feet at the bent, with the following gross bearing pressures:

- East Abutment: 2,400 psf service load; 3,300 psf factored load.
- Bent/Pier: 2,000 psf service load; 2,900 psf factored load.
- West Abutment: 3,900 psf service load; 5,400 psf factored load.

4.0 SITE CONDITIONS

At the time of our field exploration, the pedestrian trail and west abutment locations consisted of moderately steep slopes, with the west abutment and southern portion of the trail sloping eastward toward I-215, and the central and northern portion of the trail sloping down to the west and southwest away from I-215. Vegetation on these slopes was relatively sparse, with a few native grasses and weeds. The east bent and abutment locations consisted of slightly to moderately steep slopes, which sloped downward to the northwest toward I-215.

5.0 SUBSURFACE EXPLORATION

Under the direction of a qualified member of our geotechnical staff, subsurface explorations were conducted at the site on September 22, 2005 by excavating four test pits and on October 10, 2005 by drilling two exploratory test holes at the site. The test pits were excavated to depths of approximately 10 and 17 feet below the existing ground surface on the west side of I-215, and the test holes were drilled to depths of about 21½ to 41½ feet below the existing ground surface. The test pits were excavated using a rubber-tire backhoe and samples were obtained from the soils within the test pits. The test holes were drilled using a truck-mounted hydraulic drill rig and hollow stem augers to allow sampling of undisturbed soil at depth through the augers. The approximate locations of the test holes with respect to the proposed construction are shown on Figure 2, *Site Plan and Location of Test Holes & Test Pits*, included at the end of this report. Graphical representations and detailed descriptions of the soils encountered are shown on Figures 3 and 4, *Test Hole Log*, and on Figures 5 through 8, *Test Pit Log*. A key to the symbols and terms on the logs is presented on Figure 9, *Legend*.

During drilling, samples of the subsurface soils were collected at 2- to 5-foot intervals at each test hole location. Disturbed samples were collected with a 2-inch outside diameter (OD) split-spoon sampler driven 18 inches into otherwise undisturbed soil using a 140-pound hammer that free falls through a distance of 30 inches. The number of hammer blows required to drive the sampler through the final 12 inches of penetration is the blow count, which is recorded on the logs at the respective sample depth. Individual blow count increments are indicated on the logs when 50 blows were achieved before 6 inches of penetration was reached. Blow counts provide a reasonable indication of the in-place relative density of sandy soils, except when sands were observed heaving up into the augers. The penetration resistance value provides only an indication of the relative stiffness of cohesive (clayey) materials, since the penetration resistance for these soils is a function of the moisture content. Considerable care must be exercised in interpreting the standard penetration value in gravelly soils, particularly if the size of the gravel particle exceeds the inside diameter of the sampling spoon.

Relatively undisturbed samples were obtained by pushing a 3-inch OD thin-walled tube into soils below the augers. Relatively undisturbed block samples and disturbed bag samples were obtained from within the test pits. The soils were logged and classified by visual examination in the field using the guidelines of the Unified Soil Classification System (USCS). The collected samples were packaged and transported to our Orem, Utah laboratory.

6.0 LABORATORY TESTING

Selected soil samples were tested in the laboratory to assess pertinent engineering properties and to aid in classification. Laboratory testing consisted of natural moisture content and dry density tests, mechanical gradation analyses, Atterberg limit determinations, one-dimensional consolidation-swell testing, and direct shear tests. The table below presents the results of the laboratory testing. Test results are also given on the enclosed logs at the respective sample depths and on Figures 10 and 11.

Table 1: Laboratory Test Results

TEST HOLE NO.	DEPTH (feet)	NATURAL MOISTURE (%)	NATURAL DRY DENSITY (pcf)	ATTERBERG LIMITS		GRAIN SIZE DISTRIBUTION (%)			MATERIAL TYPE
				LIQUID LIMIT	PLASTICITY INDEX	GRAVEL #4	SAND	SILT/ CLAY #200	
TH-1	5	3	---	---	---	32	56	12	SM
TH-1	15	15	---	29	8	13	36	51	CL
TH-2	2½	5	---	---	---	39	44	17	SC
TH-2	25	11	---	21	5	15	52	33	SC-SM
TH-2	35	10	---	21	6	32	38	30	SC-SM
TP-1	2	5	---	---	---	60	30	10	GP-GM
TP-1	9½	7	---	---	---	34	56	10	SP-SM
TP-2	4	17	98	25	6	---	---	---	CL-ML
TP-2	8	24	89	26	5	---	---	—	CL-ML
TP-2	13	14	---	---	---	29	32	39	SM
TP-3	2	3	---	---	—	35	37	28	SC
TP-3	6	4	---	---	---	59	32	9	GP-GM
TP-4	5	5	---	---	---	9	59	32	SC
TP-4	10	5	---	21	2	21	59	20	SM

7.0 SUBSURFACE CONDITIONS

7.1 Soil Types

The results of our field exploration and laboratory testing indicate that the subsurface soils at the exploration points varied, depending on the location. At the east abutment (TH-1), the soils encountered consisted of 6 inches of fill overlying Silty SAND with gravel (SM) overlying Sandy Lean CLAY (CL), extending to a depth of approximately 21½ feet below the surface. At the bent location (TH-2), the soils encountered consisted of about 4 feet of fill overlying Clayey GRAVEL with sand (GC) and Silty Clayey SAND with gravel (SC-SM), extending to a depth of approximately 41½ feet below the surface. At the west abutment (TP-2), the soils encountered consisted of about 3 inches of topsoil overlying Sandy SILTY CLAY (CL-ML) and Silty SAND with gravel (SM), followed by Clayey GRAVEL with sand (GC), extending to a depth of approximately 17 feet below the surface. Blow counts within the test holes varied from 18 to 60 blows per foot.

At TP-1, the soils consisted of Poorly Graded GRAVEL with silt and sand (GP-GM) overlying Poorly Graded SAND with silt and gravel (SP-SM), extending to a depth of approximately 10 feet below the surface. At the other test pit (TP-3 and TP-4) locations along the trail, approximately 6 inches of topsoil was encountered overlying Clayey SAND with gravel (SC) and Poorly Graded GRAVEL with silt and sand (GP-GM), extending to a depth of approximately 10 to 10½ feet below the surface.

Graphical representations and detailed descriptions of the soils encountered are shown on Figures 3 through 9. The stratification lines shown on the logs represent the approximate boundary between soil units; the actual transition may be gradual. Due to natural variations inherent in soil deposits, care should be taken in interpolating between and extrapolating beyond exploration points.

7.2 <u>Groundwater Conditions</u>

Groundwater was not encountered during our field exploration. Note that groundwater elevations will fluctuate in response to the season, precipitation, river flow and other on- and off-site influences. Precisely quantifying these fluctuations would require long term monitoring which is beyond the scope of this study.

8.0 SEISMIC CONSIDERATIONS

8.1 Geologic Setting

The subject site is located on the eastern margin of Salt Lake Valley at the base of the Wasatch Mountains. The Wasatch Range to the east of the site forms the eastern boundary of the Basin and Range physiographic province. The mountains to the east are comprised of Paleozoic sedimentary bedrock. The north trending Wasatch fault zone generally lies at the base of the Wasatch Range and separates the Basin and Range physiographic province to the west from the Middle Rocky Mountain and Colorado Plateau physiographic provinces to the east. Seismic displacement within the Wasatch Fault Zone during the Tertiary and Quaternary geologic periods has resulted in the uplift of the Wasatch Range and relative down drop of the valley.

In addition to the Wasatch fault zone, the area has also been influenced geologically by Lake Bonneville, an ancient fresh water lake which formerly covered the valleys of western Utah. The shoreline of the lake reached a maximum elevation of approximately 5,170 feet above sea level, which is just above the elevation of the site. Evidence of this shoreline, known as the Bonneville Level, and several others which formed as the lake level fluctuated or dropped, is visible at places along the foothills of the Wasatch Range.

The surficial geology of the Wasatch fault zone and the eastern margin of the Salt Lake Valley has been mapped by Personius and Scott[1]. The surficial geology at the location of the site has been mapped as a combination of Mesozoic sedimentary bedrock, Quaternary alluvial stream and fan deposits, and artificial fill. The steep mountain slopes and a rock outcrop just east of the site are comprised of sedimentary bedrock that consists of sandstone and limestone. The areas to the west of the outcrop are comprised of younger alluvial fan deposits on the east side of I-215 and younger alluvial stream deposits on the west side of I-215. A substantial amount

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[1] Personius, S.F. and Scott, W.E., 1992, "Surficial Geologic Map of the Salt Lake City Segment and Parts of Adjacent Segments of the Wasatch Fault Zone, Davis, Salt Lake, and Utah Counties, Utah" Map I-2106.

of embankment fill has been placed north of the site where I-215 crosses over the canyon created by Parley's Creek.

8.2 Faulting/Seismicity

Based on published data, no active faults are known to traverse the site. The mapping by Personius and Scott (referenced above) indicates an inferred fault near the site, but Hecker[2] indicates that faulting along the base of the Wasatch Range at the mouth of Parley's Canyon is older than 10,000 years. The exact location of this older fault is not known in relation to the site, but it is possible that it traverses near the proposed east abutment where it appears that alluvial fan materials abut against a rock outcrop. Since the fault is not considered active (defined as younger than 10,000 years) and since Hecker (*Ibid*) indicates that post-Bonneville movement has been minimal, it is our opinion that future movement on the fault is unlikely.

The site is located at approximately 40.709 degrees north latitude and -111.798 degrees west longitude. Based on a query of the U.S.Geological Survey Earthquake Hazards Program website[3], peak horizontal ground accelerations (PGA) at the site are expected to be 0.25*g* and 0.60*g* for a 10% and 2%, respectively, probability of exceedance in 50 years. For the 2% probability of exceedance in 50 years, the spectral accelerations at the site are 1.46g for short periods (0.2 seconds, or Ss) and 0.56g for 1-second periods (or S_1). Based on the soil conditions encountered during our field explorations, the site appears to best fit within Site Class D.

[2]Hecker, S., 1993, Quaternary Faults and Folds, Utah, Utah Geologic Survey, Bulletin 127.

[3]http://eqint.cr.usgs.gov/eq/html/lookup-2002-interp.html

8.3 Other Geologic Hazards

Other geologic hazards, such as landsliding and rock fall, do not appear to be an issue at the site. Liquefaction is also not expected to be an issue since groundwater was not encountered and the soils at the site appear to be relatively dense and/or clayey.

9.0 FOUNDATIONS

9.1 General

The foundation recommendations presented in this report are based on the soil conditions encountered at the site, the results of laboratory testing on samples of the native soils, and the foundation loading conditions presented in Section 3.0, *Proposed Construction*, of this report. If loading conditions are significantly different, we should be notified in order to re-evaluate our design parameters and estimates, and to provide additional recommendations if necessary. We understand that the new bridge structure will be supported on conventional spread footings and a drilled shaft foundation is not being considered at this time. Should this situation change, Earthtec can provide appropriate recommendations, as needed. Recommendations for shallow foundations as presented herein generally follow current AASHTO LRFD guidelines.

Conventional spread footings should not be installed on topsoil, debris, combination soils (i.e. both clay and gravel), frozen soil, or in ponded water. Foundations should also not be placed partially on cut and partially on fill. If foundation soils become disturbed during construction they should be removed or recompacted to the requirements outlined below.

Given the footing sizes and loads presented above in Section 3.0, we recommend that spread footing foundations for the east abutment and bent/pier be constructed entirely on a minimum 24 inches of properly placed and compacted structural fill (defined in Section 10.3 below). For the west abutment, spread footing foundations should be constructed entirely on a minimum 48 inches of properly placed and compacted structural fill. These thicknesses of structural fill are intended to limit the settlement within the underlying soils to about 1 inch or less for the service loads given in Section 3.0 above, as well as to provide adequate bearing capacity. Based solely on soil strength, we estimate a maximum ultimate bearing capacity of 20 ksf and a factored bearing capacity of 7 ksf for each footing. For design of these spread footings, we recommend the following parameters:

Minimum embedment for frost protection:	30 inches
Minimum strip footing width:	20 inches
Minimum spot footing width:	30 inches
Bearing pressure increase for transient loading:	33 percent

Structural fill used below foundations should extend laterally a minimum of 6 inches for every 12 vertical inches of structural fill placed. For example, if 24 inches of structural fill are required to bring the excavation to footing grade, the structural fill should extend laterally a minimum of 12 inches beyond the edge of the footings.

9.2 Estimated Settlement

We estimated potential settlements of the spread footings based on the field exploration, laboratory testing, our experience with similar soils, and approximate footing sizes and loads (see Section 3.0 above) proposed by the structural engineer. If the proposed foundations are properly designed and constructed using the parameters provided above, total settlement for non-earthquake conditions is estimated not to exceed one inch at each support location. Differential settlement between supports is anticipated to be one-half of the total settlement but could be as much as the total settlement. Additional movements may be possible during an earthquake due to ground shaking.

9.3 Retaining Walls

We understand that segmental block retaining walls will be used to support the trail, with small lengths of concrete wing walls required at the bridge abutments. These concrete retaining walls may be supported on strip footings using the recommendations provided above for the abutments. The segmental block retaining walls (including any geogrid) will be designed by others, with global stability and bearing capacity addressed in this report.

For the segmental block walls, we recommend using ultimate and factored bearing capacities of 10,000 psf and 3,500 psf, respectfully. Typically, these block walls are placed on a concrete leveling pad that is constructed on the native soils. Thus, the actual factored bearing pressure exerted on the concrete leveling pad will likely be more than 3,500 psf. We estimate that total settlements of the walls using this bearing capacity will be less than 1 inch.

The highest portions of the retaining walls will be near the west abutment, where the wall height will be approximately 10 to 14 feet, and along the trail in the vicinity of Station 23+84, where the wall height will be approximately 11 feet. We understand that geogrid will be placed behind the walls. Strength parameters for the soils beneath and behind the walls were based on the results of our field exploration and laboratory testing, on published correlations, and on our experience with similar materials. Near the west abutment, the underlying subgrade and backfill soils will likely consist of the native sandy silty clay encountered in TP-2. A direct shear test was performed for this soil, and is included as Figure 11. In the vicinity of Station 23+84, which is between TP-3 and TP-4, the supporting and backfill soils will likely consist of clayey sand. The Bureau of Reclamation[4] indicates that clayey sands have an internal friction angle of 31° ± 3° and a saturated cohesion of 240 ± 120 psf. Bowles[5] indicates that the friction angle ranges from 30° to 34° for medium dense, fine granular materials (i.e. clayey sand). Accordingly, we used the following parameters in our stability analyses:

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[4]U.S. Bureau of Reclamation, 1987, "Design Standards No. 13, Embankment Dams," Denver, Colorado.

[5]Bowles, J.E., 1988, Foundation Analysis and Design, McGraw-Hill, New York.

Table 2 - Parameters for Stability Analyses

Material	Internal Friction Angle (degrees)	Apparent Cohesion (psf)	Saturated Unit Weight (pcf)
Sandy Silty Clay (CL-ML)	30	50	125
Clayey Sand (SC)	32	200	125
Concrete Blocks	45	50	145

To analyze seismic conditions, UDOT requires that retaining walls within 50 feet of the pedestrian bridge be evaluated using the acceleration obtained from the 10% probability of exceedance (PE) in 250 years (which is roughly the same as the 2% PE in 50 years, or 0.60*g*, as discussed above). Otherwise, the acceleration value (0.25*g*) corresponding to the 10% PE in 50 years may be used. For peak accelerations greater than 0.30*g*, UDOT indicates that a pseudostatic evaluation is not appropriate, but that a Newmark displacement analysis is acceptable. For the 10% PE in 50 years event, a pseudostatic coefficient of 0.13 (about half the peak acceleration value to model sustained accelerations) was used in our stability analysis.

For the displacement analysis, the pseudostatic coefficient was varied in the stability analysis until a factor of safety of about 1.0 was obtained, in order to provide a yield acceleration of 0.37*g* for input into the displacement evaluation. Our displacement analysis, summarized on Figure 16, used this yield acceleration with the Newmark method of double integrating the acceleration induced by a 2% PE in 50 years earthquake event at the site, and obtained a maximum displacement of about 1½ inches. Considering that the batter on the segmental block wall within 50 feet of the west bridge abutment provides an offset of more than 12 inches (from top to bottom of wall), a displacement of 1½ inches during a large earthquake is not expected to cause significant problems with the wall.

Using these input parameters, we evaluated the global stability of the wall using the computer program *PCSTBL6*. This program uses a limit equilibrium (Bishop's modified) method for calculating factors of safety against sliding on an assumed failure surface and evaluates numerous potential failure surfaces, with the most critical failure surface identified as the one yielding the lowest factor of safety of those evaluated.

The wall heights analyzed are described above. UDOT requires minimum factors of safety of 1.3 for static conditions and 1.0 for seismic (pseudostatic) conditions. Our analysis indicates that the proposed segmental block walls with geogrid will meet these minimum factors of safety for global stability. Analyses results are shown on the attached Figures 12 through 15.

9.4 Lateral Earth Pressures

The lateral pressure recommendations presented herein are based upon the native sandy silty clay or clayey sand soils that exist behind the wall and reinforced zone, and upon utilization of select materials, as described below, within the reinforced zone that is placed and compacted in accordance with the recommendations presented in this report.

Lateral earth pressures acting against buried/retaining structures may be computed from the equivalent fluid densities presented in the tables below for both the static case and considering earthquake ground motion. The "active" condition may be used for walls that are able to deflect away from the backfill. For walls that are not allowed to deflect, the "at-rest" condition should be used. The "passive" condition applies to walls or structures that move into the backfill. Seismic pressures are typically modeled using an inverted triangle with the resultant located approximately 0.6 times the wall height above the wall bottom.

Table 3: Lateral Pressure Equivalent Fluid Densities—Static Case

Condition	Soil Type	Internal Friction Angle	Lateral Pressure Coefficient	Equivalent Fluid Density* (pcf)
Active	Sandy Silty Clay	30	0.33	42
	Clayey Sand	32	0.31	39
At-rest	Sandy Silty Clay	30	0.50	63
	Clayey Sand	32	0.47	59
Passive	Sandy Silty Clay	30	3.00	375
	Clayey Sand	32	3.26	405

*- based on unit weight of 125 pcf

Table 4: Lateral Pressure Equivalent Fluid Densities—Seismic Case

Condition	Soil Type	Internal Friction Angle	Equivalent Fluid Density* (pcf)
Active	Sandy Silty Clay	30	70**
	Clayey Sand	32	46***
Passive	Sandy Silty Clay	30	500**
	Clayey Sand	32	550***

* - based on unit weight of 125 pcf for backfill soils
** - using acceleration of 0.30*g* (half of 2% probability in 50 yrs.)
*** - using acceleration of 0.13*g* (half of 10% probability in 50 yrs.)

Surcharge loads applied to the backfill within the active zone behind walls must be considered for lateral pressures. AASHTO requires using a surcharge of 250 psf if vehicles are allowed to come within half of the wall height, measured from the wall face. For surcharge loads applied to the backfill, we recommend multiplying the lateral pressure coefficient by the uniform surcharge load to obtain the lateral pressure induced by the surcharge load. Note that any excavations for the new trail should not be made within 3 feet of the post foundations (to not reduce the lateral resistance being provided by the soils) for the sound wall currently located on the west side of where the trail will be located.

The design values presented above are based on drained horizontal backfill. We recommend that backfill material meeting UDOT specifications for *Select Material for MSE Walls* (beyond the bridge abutments) or *Embankment for Bridge* (adjacent to the abutments) be placed and compacted as outlined below in Section 10.4.

10.0 SITE GRADING

10.1 General Site Grading

Prior to construction, unsuitable soils and vegetation should be removed from below areas which will ultimately support structural loads. Unsuitable soils consist of topsoil, organic soils, soft/loose/disturbed soils, and any other inapt materials.

10.2 Temporary Excavations

For temporary excavations less than 5 feet deep into on-site soils, slopes should not be made steeper than 0.5H:1V (Horizontal:Vertical). Temporary excavations extending up to 10 feet in depth should not be made steeper than 1H:1V. If unstable conditions or groundwater seepage are encountered, flatter slopes or shoring or bracing may be required. Excavation slopes higher than 10 feet will require a specific stability analysis of the situation.

10.3 Fill Materials

Structural fill should consist of *Granular Borrow* per the current UDOT specifications. Some if not most of the on-site sand/gravel soils may meet these specifications and could thus be used as structural fill. Other select materials discussed herein may supercede the use of *Granular Borrow*, as appropriate. All other fill not specified may consist of *Borrow* per the current UDOT specifications.

10.4 Fill Placement and Compaction

The thickness of each lift should be appropriate for the compaction equipment that is used. Fill should be moisture conditioned, placed, and compacted in accordance with current UDOT requirements. Fill to be placed on existing slopes steeper than 5H:1V should be properly benched, with maximum bench heights of 4 feet, so that fill is placed on relatively horizontal surfaces and against relatively vertical surfaces. The bottom bench, or key, should be a minimum 10 feet wide and 3 feet deep.

We recommend that fill be tested frequently during placement. Early testing is recommended to demonstrate that placement and compaction methods are achieving the required compaction for the entire depth of fill. It is the contractor’s responsibility to ensure that fill materials and compaction efforts are consistent so that tested areas are representative of the entire fill.

10.5 Cut and Fill Slopes

Permanent cut slopes are anticipated to be stable at gradients of 1.5H:1V or flatter, for heights extending up to 10 feet. Fill slopes are anticipated to be stable at gradients of 2H:1V or flatter, for heights extending up to 10 feet. Fill should not be placed on existing slopes that are steeper than 5H:1V without benching and keying as described above. Cut and fill slopes higher than 10 feet will require a specific stability analysis of the situation.

11.0 MOISTURE CONTROL AND SURFACE DRAINAGE

Precautions must be taken during and after construction to reduce the potential for saturation of foundation soils. Over-wetting the soils prior to or during construction may result in softening and pumping, causing equipment mobility problems and difficulty in achieving compaction and may lead to some volume change in the native soils. We recommend that the following precautions be taken at this site:

1. The ground surface should be graded to drain away from the structure in all directions. We recommend a minimum fall of 6 inches in the first 10 feet.

2. Adequate compaction of foundation backfill should be provided. **Water consolidation methods should not be used**.

3. Other precautions which may become evident during design and construction should be taken.

12.0 PAVEMENT DESIGN

We understand that the pedestrian/bike trail will be paved using asphalt concrete, with some areas near the west bridge abutment being paved using Portland cement concrete. At the test pit locations, the near-surface soils consisted of gravel, silty clay and clayey sand that would be supporting the pavement. Since traffic on the trail will mostly consist of bicyclists and pedestrians, with an occasional pickup to moderately-sized truck, we believe using a minimum asphalt pavement section of 2½ inches of asphalt concrete or a minimum 5 inches of Portland cement concrete over 6 inches of road base is appropriate for this project.

13.0 GENERAL CONDITIONS

The exploratory data presented in this report were collected to provide geotechnical design recommendations for this project. The exploration points may not be indicative of subsurface conditions outside the study area or between points explored and thus have a limited value in depicting subsurface conditions for contractor bidding. Variations from the conditions portrayed in the test holes and test pits may occur and could be sufficient to require modifications in the design. If during construction, conditions are different than presented in this report, please advise us so that any appropriate modifications can be made.

The geotechnical study as presented in this report was conducted within the limits prescribed by our client, with the usual thoroughness and competence of the engineering profession in the area. No other warranty or representation, either expressed or implied, is intended in our proposals, contracts or reports.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;

EARTHTEC TESTING AND ENGINEERING, P.C.

William G. Turner, P.E.
Senior Geotechnical Engineer

Steven L. Smith, P.E.
Principal Engineer

LEGEND

PROJECT: Parleys Trail & Pedestrian Bridge over I-215 **DATE:** Sep & Oct 2005
CLIENT: H.W. Lochner **LOGGED BY:** S.G.

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR SOIL DIVISIONS			USCS SYMBOL	TYPICAL SOIL DESCRIPTIONS
COARSE GRAINED SOILS (More than 50% retaining on No. 200 Sieve)	GRAVELS (More than 50% of coarse fraction retained on No. 4 Sieve)	CLEAN GRAVELS (Less than 5% fines)	GW	Well Graded Gravel, May Contain Sand, Very Little Fines
			GP	Poorly Graded Gravel, May Contain Sand, Very Little Fines
		GRAVELS WITH FINES (More than 12% fines)	GM	Silty Gravel, May Contain Sand
			GC	Clayey Gravel, May Contain Sand
	SANDS (50% or more of coarse fraction passes No. 4 Sieve)	CLEAN SANDS (Less than 5% fines)	SW	Well Graded Sand, May Contain Gravel, Very Little Fines
			SP	Poorly Graded Sand, May Contain Gravel, Very Little Fines
		SANDS WITH FINES (More than 12% fines)	SM	Silty Sand, May Contain Gravel
			SC	Clayey Sand, May Contain Gravel
FINE GRAINED SOILS (More than 50% passing No. 200 Sieve)	SILTS AND CLAYS (Liquid Limit less than 50)		CL	Lean Clay, Inorganic, May Contain Gravel and/or Sand
			ML	Silt, Inorganic, May Contain Gravel and/or Sand
			OL	Organic Silt or Clay, May Contain Gravel and/or Sand
	SILTS AND CLAYS (Liquid Limit Greater than 50)		CH	Fat Clay, Inorganic, May Contain Gravel and/or Sand
			MH	Elastic Silt, Inorganic, May Contain Gravel and/or Sand
			OH	Organic Clay or Silt, May Contain Gravel and/or Sand
HIGHLY ORGANIC SOILS			PT	Peat, Primarily Organic Matter

SAMPLER DESCRIPTIONS

- SPLIT SPOON SAMPLER (1 3/8 inch inside diameter)
- MODIFIED CALIFORNIA SAMPLER (2½ inch outside diameter)
- SHELBY TUBE (3 inch outside diameter)
- BLOCK SAMPLE
- BAG/BULK SAMPLE

WATER SYMBOLS

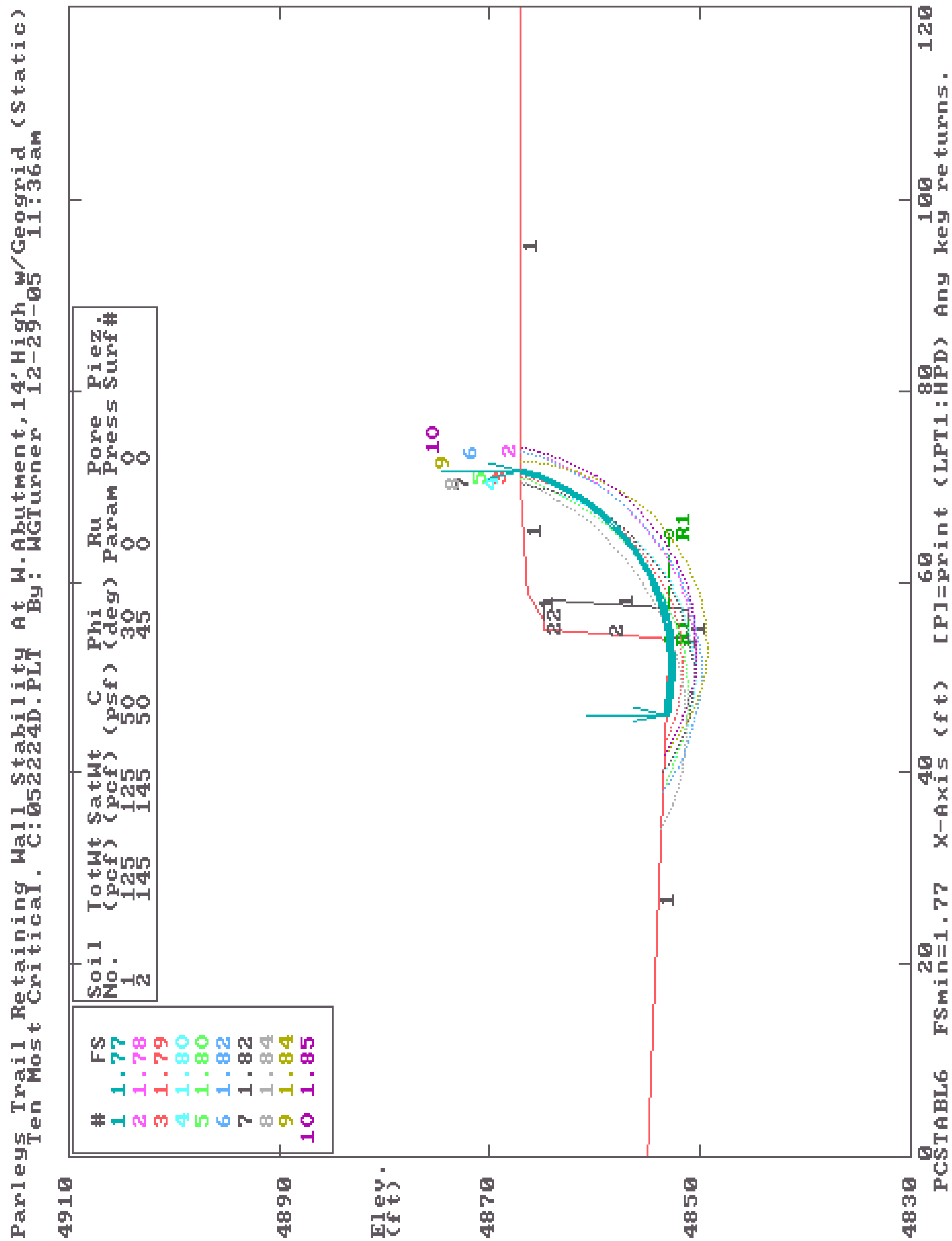
- ▽ Water level encountered during field exploration
- ▼ Water level encountered at completion of field exploration

NOTES:

1. The logs are subject to the limitations, conclusions, and recommendations in this report.
2. Results of tests conducted on samples recovered are reported on the logs and any applicable graphs.
3. Strata lines on the logs represent approximate boundaries only. Actual transitions may be gradual.
4. In general, USCS symbols shown on the logs are based on visual methods only: actual designations (based on laboratory tests) may vary.

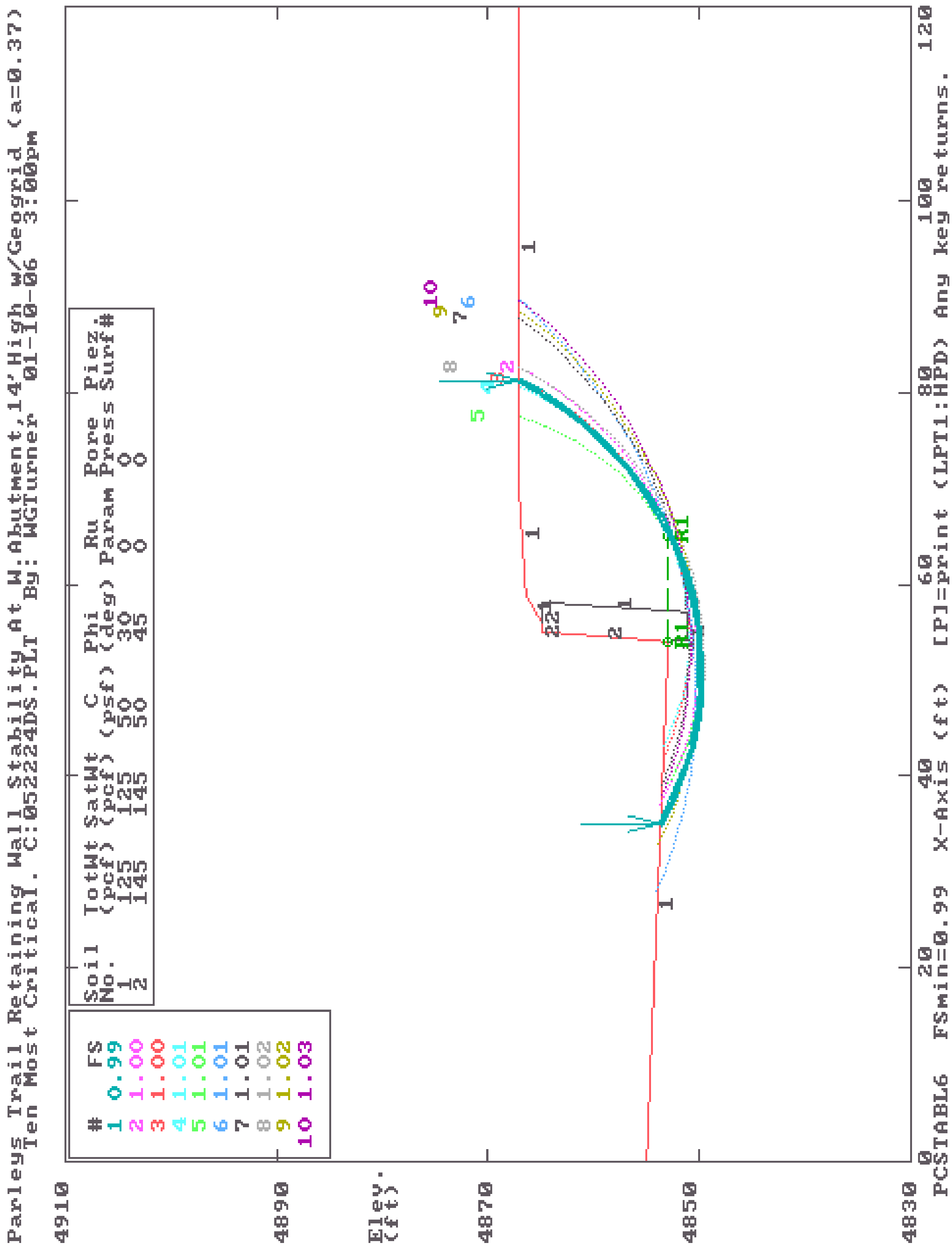
PROJECT NO.: 052224 **FIGURE NO.:** 9

STABILITY RESULTS



PROJECT NO.: 052224	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 12

STABILITY RESULTS

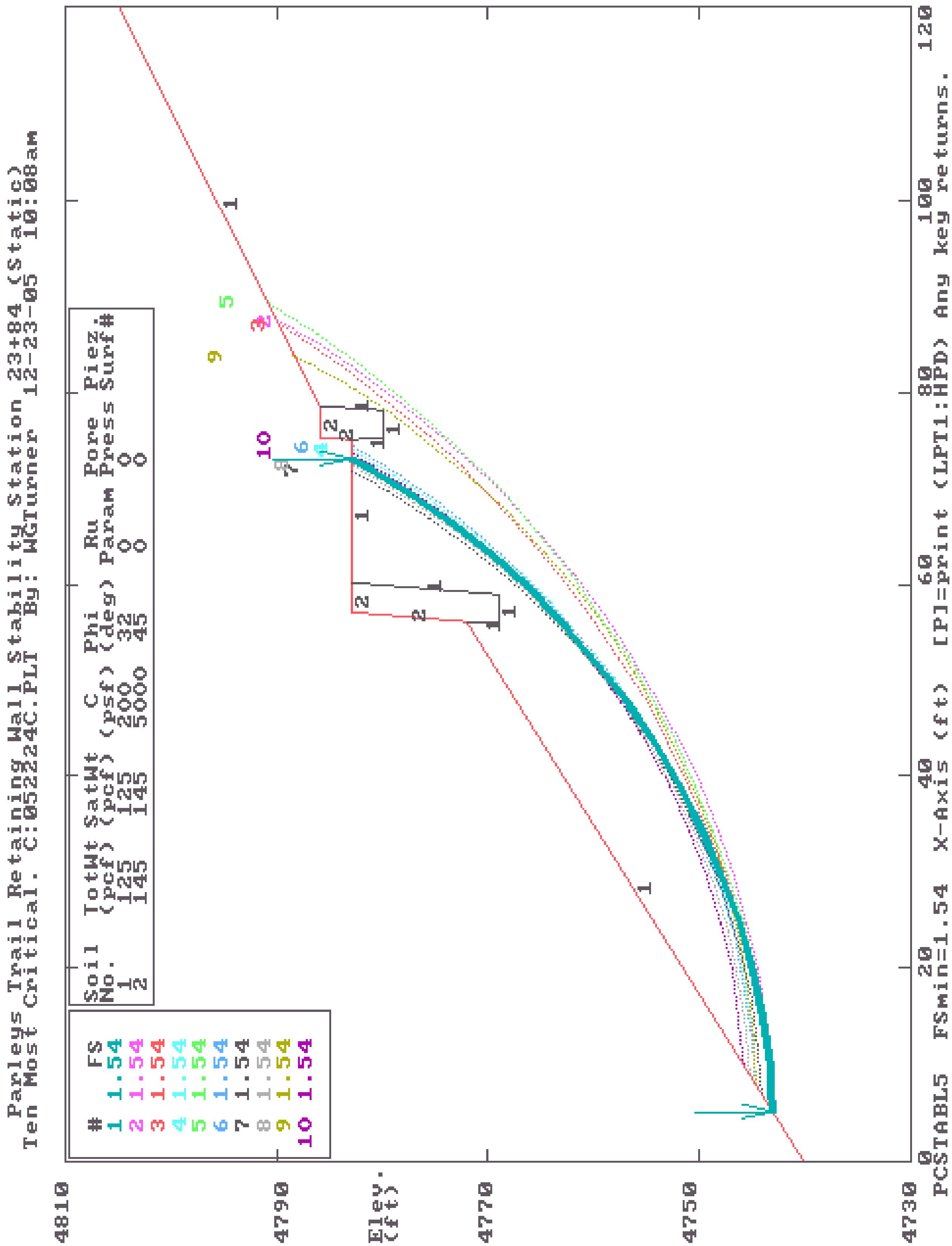


PROJECT NO.: 052224

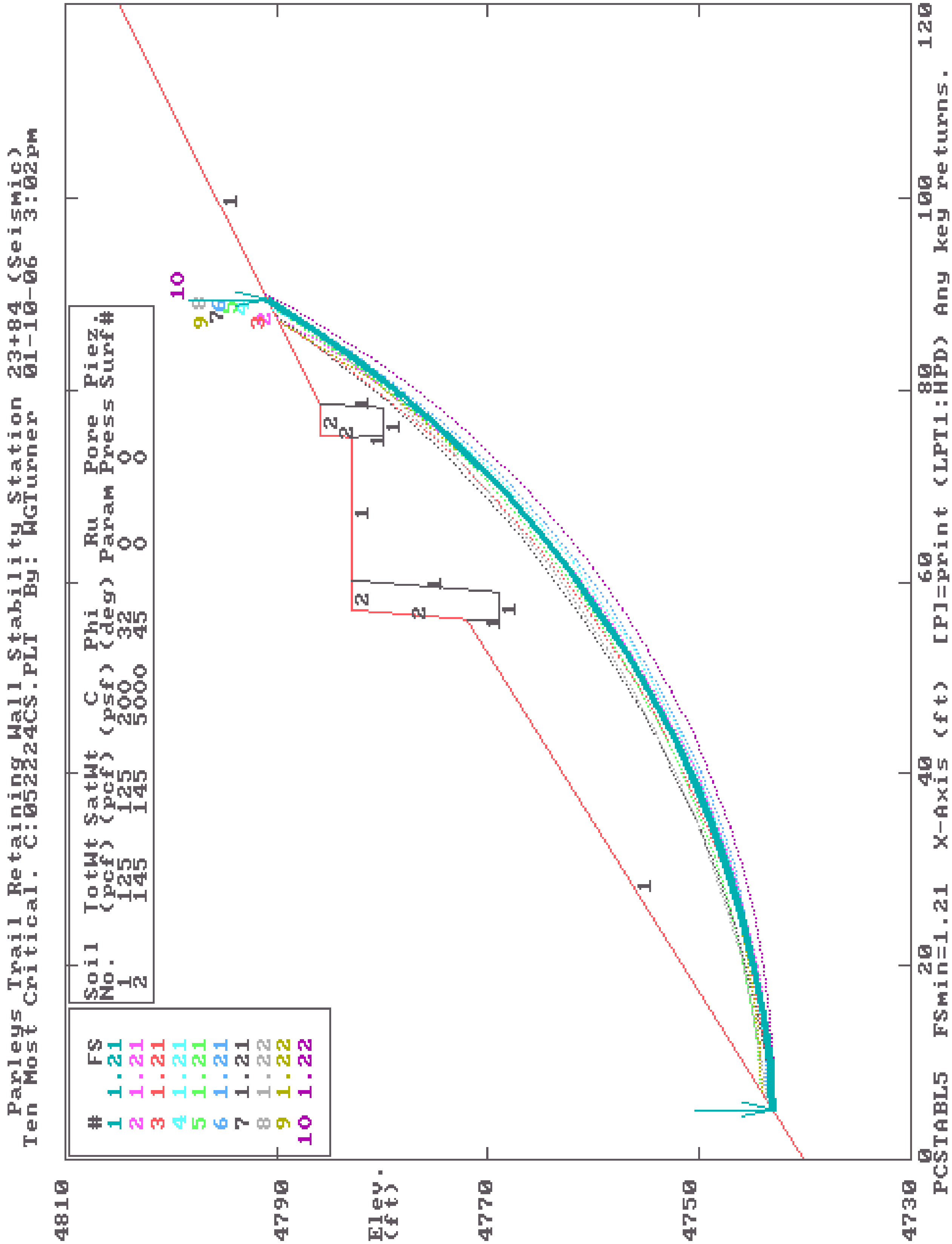
Earthtec Testing and Engineering, P.C.

FIGURE NO.: 13

STABILITY RESULTS



STABILITY RESULTS



PROJECT NO.: 052224	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 15

TEST HOLE LOG

NO.: TH-1

PROJECT: Parleys Trail & Pedestrian Bridge over I-215
PROJECT NO.: 052224
CLIENT: H.W. Lochner
DATE: 10/20/05
LOCATION: See Figure 2
ELEVATION: Approx. 4872 ft
OPERATOR: Raycon
LOGGED BY: S.G.
EQUIPMENT: ATV CME-75
DEPTH TO WATER; INITIAL ▽ :
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Blows per foot	Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			FILL: Gravel, some sand, moist, red-brown.										
		SM	Silty SAND with gravel: Dense to medium dense, moist, red-brown.										
3				■	50								
6				■	37		3			32	56	12	
9				■	27								
12				■	18								
15		CL	Sandy Lean CLAY: Some gravel, very hard, moist, red-brown (possibly highly weathered bedrock).	■	33		15	8	29	13	36	51	
18													
21			- No sample recovered at 20 feet.	■	30								
24			Bottom at about 21½ feet.										

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 052224

Earthtec Testing and Engineering, P.C.

FIGURE NO.: 3

TEST HOLE LOG

NO.: TH-2

PROJECT: Parleys Trail & Pedestrian Bridge over I-215
PROJECT NO.: 052224
CLIENT: H.W. Lochner
DATE: 10/20/05
LOCATION: See Figure 2
ELEVATION: Approx. 4854 ft
OPERATOR: Raycon
LOGGED BY: S.G.
EQUIPMENT: ATV CME-75
DEPTH TO WATER; INITIAL ▽ :
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Blows per foot	Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			ASPHALT: 2 inches										
			FILL: Silty to clayey sand with gravel, medium dense, moist, red-brown.										
3					24		5			39	44	17	
		GC	Clayey GRAVEL with sand: Medium dense to dense, moist, red-brown. - No sample recovered at 5 feet.										
6					28								
9					60								
12					24								
15			- No sample recovered at 15 feet.		52								
18		SC-SM	Silty Clayey SAND with gravel: Medium dense to dense, moist, red-brown.										
21					15								
24													

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 052224

Earthtec Testing and Engineering, P.C.

FIGURE NO.: 4a

TEST HOLE LOG

NO.: TH-2

PROJECT: Parleys Trail & Pedestrian Bridge over I-215
PROJECT NO.: 052224
CLIENT: H.W. Lochner
DATE: 10/20/05
LOCATION: See Figure 2
ELEVATION: Approx. 4854 ft
OPERATOR: Raycon
LOGGED BY: S.G.
EQUIPMENT: ATV CME-75
DEPTH TO WATER; INITIAL ▽ :
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Blows per foot	Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
		SC-SM	Silty Clayey SAND with gravel: Medium dense to dense, moist, red-brown.		25		11	5	21	15	52	33	
27													
30					34								
33													
36					Push		10	6	21	32	38	30	
39					17								
42			Bottom at about 41½ feet.										
45													
48													

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 052224
Earthtec Testing and Engineering, P.C.
FIGURE NO.: 4b